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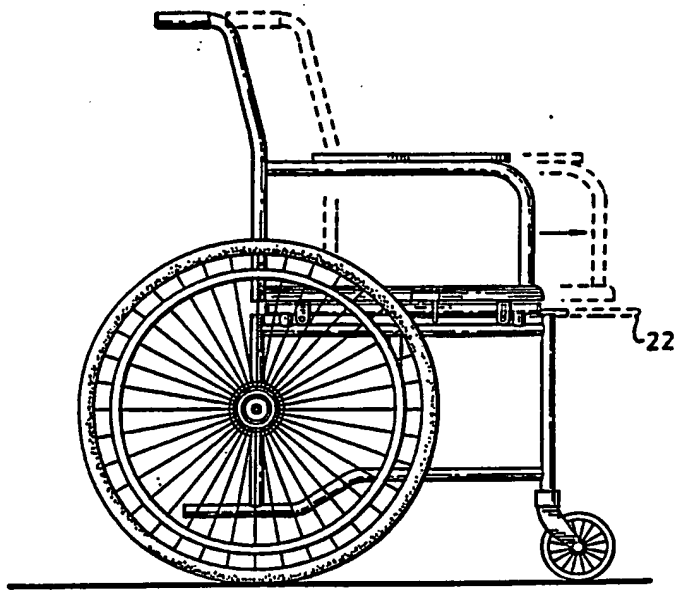
(54) Title: SLIDING SEAT FOR WHEELCHAIRS

(57) Abstract

A mechanism which permits the fore and aft seat position of a wheelchair to be optimized for any particular task is described. The seat platform (14) is slidable along tracks or rails (8) mounted on the wheelchair frame (6), and is lockable in any one of a number of positions along the tracks. A pair of generally C-shaped rails (8), preferably telescoping, face each other, running fore and aft. A seat platform (14) runs in the rails. In one embodiment, a rack (16) is beneath the seat platform, running fore and aft. A handwheel (22) and a pinion gear (20), coaxially mounted for rotation together with each other about a vertically oriented shaft (26) projecting downwardly from the underside of the seat platform, are mounted such that the handwheel projects forward of the front edge of the seat platform. The handwheel rotates the pinion gear, which in turn drives a spur gear (23) which engages the rack. The handwheel may be readily rotated to thereby produce fore and aft movement of the seat platform with respect to the wheelchair. In another embodiment, a long screw (40), preferably square-threaded, is mounted on bearings (42) on the underside of the front and back of the seat, and is rotatable via a hand crank (44). Rotating the screw pulls the seat in one direction or the other with respect to a fixed nut (48) mounted on a cross-piece (49) between the frame members. These embodiments permit the fore and aft seat positions to be varied very easily by the wheelchair user and/or an attendant.



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SLIDING SEAT FOR WHEELCHAIRS

TECHNICAL FIELD

This invention relates to a wheelchair seat which is slidable fore and aft on the wheelchair frame.

BACKGROUND ART

The problem which is addressed by this invention is that the wheelchair seat position which is most desirable for one activity (e.g. wheeling down a hill) may be least desirable for another (e.g. transferring into a car). Currently, wheelchair designers, prescribers and users are forced to make compromises in selecting a seat position which will be most appropriate throughout this range of activities.

A great many people, ranging in age from the young child to the very elderly, spend much of their waking time in wheelchairs. The usage rate averages 3.3 per 1000 population, and is about five times greater in the group over 65 years old, a rapidly growing segment of the population. The problems which may necessitate the use of a wheelchair are numerous, as are the activities performed by wheelchair users. These activities range from simply sitting, where the only purpose of the wheelchair may be to permit an attendant to transport someone from one room to another, to the highly athletic. Understandably, no single wheelchair design is suitable for all ages, disorders and activities. Although the numbers of wheelchair models and options have increased dramatically in the past decade, a negative consequence of this development is that many patients obtain wheelchairs which are ill-suited to them.

Wheelchair stability is one important consideration in wheelchair selection and use. Rear

tipping accidents occur when an individual in a wheelchair leans backward, rapidly accelerates forward, wheels up an incline or strikes a low obstacle while wheeling backwards, particularly if the individual's centre of mass is high and posterior (as with heavily muscled paraplegics or amputees). Forward tipping accidents commonly occur when wheelchair users lean forward, or transfer forward from a wheelchair to another surface, or when deceleration occurs while moving forward, particularly down an incline.

Statistics documenting the incidence and circumstances surrounding wheelchair accidents due to instability are not well established, but such accidents appear to be very common. An estimated 30,000 wheelchair-related accidents, serious enough for the victim to seek attention at an emergency room, occur in the United States each year. The consequences of such wheelchair accidents may be simple sprains and lacerations, but fractures are not uncommon and about 50 wheelchair-related accidental deaths are reported each year to the U.S. Consumer Product Safety Commission. Many wheelchair users are ill-equipped to protect themselves during a fall due to lack of strength, coordination or range of motion. Also important are the "near misses" - individuals who experience transient instability while attempting new tasks are wary about attempting such tasks again.

A number of measures are already available for improving a wheelchair's stability - the rear axles can be shifted in the vertical and horizontal directions relative to the chair frame, the position of the person in the seat can be changed, the seat position can be moved forward or back (though not at will with the user seated), the caster diameter can be increased, or counterweights may be used. Out-riggers may be added to

limit the extent of the instabilities which do occur.

Stability is not the only factor to be considered in determining the seat position. A related parameter, for example, is pitch-axis control, i.e. the ease with which a wheelchair user or his attendant can lift the front wheels, such as to make short-radius turns or to negotiate obstacles such as curbs or door jambs. Pitch-axis control increases as the position of the user is moved backward relative to the rear wheels. Various parameters are shown in Table 1 below, which shows how those parameters are affected by altering the wheelchair seat position:

TABLE 1 - EFFECT OF ALTERING WHEELCHAIR SEAT POSITION

Parameter	Seat Position Back	Forward
Rear stability	decreased	increased
Forward stability	increased	decreased
Pitch-axis control	increased	decreased
Rolling resistance	decreased	increased
Downhill turning tendency	decreased	increased
Propulsive efficiency	increased	decreased
Leg flexion	decreased	increased
Sideways transfers	harder	easier
Forward transfers	harder	easier
Forward reach	less	more

DISCLOSURE OF INVENTION

It is an object of the invention to provide a mechanism which permits the fore and aft seat position to be optimized for any particular task, by providing a seat

which is readily moveable fore and aft, and which is lockable in any desired fore and aft position.

In the invention, the wheelchair seat, while occupied by the wheelchair user, can be quickly and easily moved forward or backward from the usual position relative to the wheelchair frame and wheels, by the user or an attendant. The invention differs from present technology by making it possible for the wheelchair user to vary the seat position many times each day, in response to the varying and often conflicting demands of different activities and terrains. As shown in Table 1 above, the seat position affects stability (and thereby safety), pitch-axis control (ability to perform a "wheelie"), rolling resistance, downhill turning tendency, propulsive efficiency, the degree of hip and knee flexion, the ability to transfer to another surface, and the ability to reach forward for items on a table or desk, when the wheelchair is prevented from advancing.

More specifically, the invention includes a seat which is slidable along tracks mounted on the wheelchair base or frame, and which is lockable in any one of a number of positions along the tracks. Simple mechanical means are provided to move the seat along the tracks, such as a hand wheel or crank driving a pinion gear to move the seat along a rack attached to the wheelchair base, or a hand wheel or crank driving a worm gear to pull the seat through a nut mounted to the wheelchair base, or other like mechanisms.

Further features of the invention will be described or will become apparent in the course of the detailed description below.

The advantages of such a wheelchair seat are numerous, and include some or all of the following:

1. By moving the seat forward, rear stability is increased, reducing the likelihood of rear

tipping accidents when leaning backward, when accelerating forward (particularly on an uphill incline), or when decelerating while moving backwards.

2. By moving the seat back, forward stability is increased, decreasing the likelihood of a forward tipping accident when leaning forward, when transferring forward or when striking an obstacle, particularly on a downhill incline.

3. By moving the seat back, pitch-axis control is increased, making it easier for a user (or an attendant) to tip the chair onto its rear wheels (a "wheelie") to overcome an obstacle (like a curb or door jamb) or to make a tight-radius turn.

4. When the seat is moved back, rolling resistance decreases.

5. When the seat is moved back, downhill turning tendency decreases.

6. The relationship of the arms and hands to the push rims of the wheel can be improved to one which is comfortable and maximizes propulsive efficiency.

7. The degree of leg flexion at the hips and knees can be altered to one which is comfortable, less tiring and less likely to increase spasticity.

8. If the seat is moved forward, sideways transfers (actually forward-sideways) between the wheelchair and another surface are less likely to be limited by bumping into the rear wheel or scraping the buttocks over it (causing damage to the skin and underlying tissues).

9. A user may more easily transfer forward onto another surface if the seat is slid forward,

particularly if the forward position of the front wheels is blocked by an obstacle.

10. A user may more easily reach forward for items on a surface (e.g. table or desk) if the seat is slid forward, particularly if the forward position of the front wheels is blocked by an obstacle.

Desirable design features for the sliding seat within current practical limits, utilized with the user seated in the wheelchair, included the following:

1. The extent of seat position variation in the fore-aft direction relative to the frame and wheels should be ideally 25 - 40 cm, although significant effects on stability have been documented with as little as 5 cm of movement.
2. The seat position should be able to be altered quickly (2 s for a user with normal upper limbs).
3. The seat position should be able to be altered easily (requiring minimal effort or skill by a user with one normal upper limb). Moving the seat fore and aft should not require much skill, strength or coordination. It should not be necessary to use the legs as they may be missing or paralysed.
4. The mechanism should be light, preferably adding no more than two or three kg to the weight of the chair.
5. The mechanism should be durable, withstanding the equivalent of 10 position shifts per day for 5 years.
6. The unit should require little maintenance.
7. The unit should be inexpensive, preferably no more than $600 retail.
8. The unit should be capable of being retro-

fitted to most existing chairs.

9. The unit should be capable of being incorporated into new chairs without major design changes in the chairs.

10. The unit should be adjustable or come in different sizes, so as to fit the full range of chair sizes.

11. There should be a mechanism by which the extent of fore and aft slide can be limited (i.e. by "stops") on an individualized basis. This is intended to prevent some users from inadvertently overshooting safe limits and tipping over.

12. The sitting surface should be flat and rigid. A cushion would be placed on top, but there is a wide range of styles that prescribers and users would prefer to select separately.

13. The superior surface of the rigid sitting surface should be capable of being suspended below the level of the wheelchair frame ("drop seat").

14. The back upright and armrests should move with the seat.

15. The use of the unit should not interfere with any of the other adjustments commonly employed (e.g. tilting or raising the seat).

16. The unit should be functional even if the plane of fore-aft movement is not horizontal. It is common for the wheelchair frame to be raised slightly in front. This design consideration may tip the balance toward a system that provides some mechanical advantage (e.g. a screw arrangement) or assistance (e.g. springs or hydraulic assist) when the seat is being slid uphill or against slight resistance from

increased tone in the legs.

17. The sliding seat should be easily removable or hinged on one side to allow the chair to be "broken down" or folded for transportation and storage.

18. The ease of moving the seat fore and aft should, if the mechanism is horizontal, be unaffected by the user's weight.

19. It should be possible to operate the mechanism while moving (e.g. during a road race).

20. The available positions (within the endpoints) preferably should be infinite.

21. It should be possible to individualize the location of the seat-position control to accommodate individuals with a missing or weak arm, and to place the control out of the subject's range when impaired ability or cognition would make operation by an attendant more desirable.

22. An option that may be beneficial to some users would be to have the footrests move with the seat, although this would interfere with some of the desired functions.

The invention attempts to meet as many of these design goals as is reasonably possible.

BRIEF DESCRIPTION OF DRAWINGS

In order that the invention may be more clearly understood, the preferred embodiments thereof will now be described in detail by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of one embodiment of the wheelchair seat mechanism;

Fig. 2 is a corresponding perspective view, cut away and exploded to show the seat mechanism;

Fig. 3 is a side view of a wheelchair with the seat mechanism;

Fig. 4 is a front view of the mechanism;

Fig. 5 is a bottom view of the mechanism;

Fig. 6 is a side view of the mechanism;

Fig. 7 is a front cross-sectional view at 7-7 in Fig. 6;

Fig. 8 is a perspective view of one of the rails supporting the seat;

Fig. 9 is a side view of another embodiment of the invention, in which a long screw and crank handle is used to move the seat platform;

Fig. 10 is a front view of this second embodiment;

Fig. 11 is a side view of the second embodiment, in section;

Fig. 12 is a front view of the second embodiment, in section;

Fig. 13 is a bottom view of the second embodiment, showing the seat platform in a central position;

Fig. 14 is another bottom view of the second embodiment, showing the seat platform in a forward position; and

Fig. 15 is a side view of the second embodiment, in section, showing the seat platform in the forwardmost position, with other positions shown in ghosted lines.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to the drawings, the preferred embodiments of the invention are described as follows:

Referring first to the embodiment shown in Figs. 1 - 8, two base crossbars 2 are provided, passing laterally between sides of the wheelchair at fore and aft

locations. The crossbars are preferably suspended below the normal seat level by a so-called "drop-seat" arrangement, by virtue of J-shaped drop hooks 4 which hook over the side frame members 6 of the wheelchair. The drop seat arrangement is preferable so that the mechanism of the invention can be accommodated without necessarily increasing the height of the seat for the user, although with some wheelchair designs drop seat arrangements may not be possible. Drop seat arrangements are not unique to the present invention. A locking type may be used to prevent the entire seat and mechanism from being lifted off the chair frame, but must be releasable in the case of a folding wheelchair frame, so that the chair can be folded.

As an alternative to the two base crossbars, a solid base platform may be used, again preferably suspended below the normal seat level in a drop-seat arrangement. A solid base platform may add undesirably to the weight, but may be desirable for rigidity and support.

Mounted to and above the crossbars or base platform as the case may be, spaced apart towards either side of the wheelchair and running parallel to the sides, are two rails 8, similar to those found in many drawer guides or filing cabinets, and preferably telescoping as in many drawer guides or filing cabinets. The rails are generally C-shaped in cross-section, with their openings facing inwardly. The rails each receive a roller 10 mounted on roller brackets 12 secured to the underside of the seat platform 14. By virtue of the rollers moving along and within the rails, fore and aft movement of the seat platform is possible. The front of the seat is supported by rollers 15 mounted near the forward end of the rails. Bars 17 are mounted on the underside of the seat platform for the rollers to ride along.

In addition to having the above-mentioned rollers 10 mounted thereto, the seat platform has a relatively large diameter handwheel 22 mounted on a rotatable shaft 24 which is bearing-mounted around a fixed vertical shaft 26 projecting downwardly from the platform. The diameter and position of the handwheel is such that at least a portion thereof projects slightly forward of the front edge of the seat platform, so that it may be readily reached by the wheelchair user, or slightly rearward of the platform so that it may be readily reached by an attendant. Preferably, the edge of the wheel has serrations or other means to facilitate gripping, particularly for users with weak hands, e.g. partial quadriplegics. The wheel may also be provided with suitable position indicia, e.g. a scale of -5 to +5 cm.

Also mounted on the rotatable shaft, below the handwheel for rotation therewith, is a pinion gear 20, which engages teeth 18 on a rack 16, either directly or preferably via an intermediary or "spur" gear 23 which is mounted beneath the seat platform. The rack is mounted to and above the crossbars 2 or base platform, towards one side with the teeth facing inwardly towards the centerline of the chair.

Thus rotation of the handwheel produces rotation of the pinion gear and spur gear, which causes the seat platform to move fore and aft of a central position along the rack, supported on the rollers.

Stops 28 are provided in the tracks to prevent the rollers from running off the ends of the tracks, which would be highly undesirable for obvious reasons. The stops need not be positioned at the ends of the tracks, but could be positioned at any desirable locations therealong, to restrict the permitted range of fore and aft movement. Preferably, the stops are

adjustable, because different persons will have different needs and safety limits. Fig. 8 only shows a stop to limit forward movement, but a similar stop would be provided to limit rearward movement as well.

As mentioned above, a suitable locking mechanism is required, so that the seat can be locked in any one of a finite or infinite number of positions. One suitable mechanism would be as illustrated in Fig. 5, where the handwheel 22 is provided with a plurality of holes 30 near the circumference of the wheel, and a pin 33 is positioned to be movable relative to an assembly 32, in and out of any one of the holes, by the action of a cable 36 connected to a locking control lever 38. The locking control lever could be mounted to the wheelchair armrest or any other suitable location where the wheelchair user or attendant can have ready access to it. Preferably, a conventional ratcheting mechanism (not specifically illustrated) is also employed, to prevent rollback when the chair is on an incline and the locking mechanism is disengaged in order to change the position of the seat.

It should be apparent that the seat platform could be slidably mounted in a number of different ways, e.g. using any one of a number of different rail configurations, with or without rollers. The seat platform could also be lockable in any desired position by many different means. For example, the above-mentioned ratcheting mechanism which is preferred to prevent rollback could be lockable to prevent movement in either direction. Means other than the rack and pinion arrangement with the handwheel could be used to control the motion, e.g. a wormscrew as described below may be advantageous, and indeed for many users it may not be necessary to control the motion by means such as a handwheel; it may be sufficient that the seat platform

is slidable and lockable, with the forces necessary for movement being gravity or the user's hand(s) gripping the wheelchair frame or an extension thereof. The smooth and controlled movement afforded by the rack and pinion and handwheel may not be necessary for many users.

As another example of the invention, Figs. 9 - 15 show a "wormscrew" arrangement, which is presently the preferred embodiment for most applications. In this embodiment, a long screw 40, preferably square-threaded, is mounted longitudinally between bearings 42 on the underside of the front and back of the seat platform. The screw is rotatable via a hand crank 44 at the front end of the screw, and/or by a hand crank 44' at the rear end of the screw, such rotation pulling the seat platform in one direction or the other with respect to a fixed nut 48 mounted on a cross-piece 49 between the frame members 6. If a more positive lock is desired than that afforded simply by virtue of friction and the relatively large mechanical advantage of the screw and crank arrangement, the hand crank may be secured via a clip 46, in which position the crank is out of the way and does not interfere with the user's legs.

As a stop means, two stop nuts 50 may be secured to the long screw, one ahead of the fixed nut 48 and the other behind the fixed nut, the stop nuts rotating with the screw such that one or the other comes into contact with the fixed nut at fore and aft extreme positions, thereby providing means for adjusting the maximum fore and aft positions of the seat platform. Each stop nut has an anchoring screw 52 which locks it into the desired position on the long screw.

In a similar fashion to the earlier-described embodiment, a slide housing 54 sits on the frame member 6, held in place by removable pins 56 through the wheelchair frame member or under it (see Fig. 12). The

housing holds a first C-shaped rail 58 which receives a second C-shaped rail 60, attached to the seat platform 14 and guided on ball bearings 62. Preferably, the rails are telescoping as in many conventional drawer guides and filing cabinets, to provide better support at extreme extension, although for simplicity the drawings do not specifically illustrate this feature. Posts 64 are mounted to the top of the seat platform, to support an armrest and seat back assembly 66 which moves with the seat platform.

It will be appreciated that the above description relates to the preferred embodiments by way of example only. Many variations on the invention will be obvious to those knowledgeable in the field. These and other obvious variations are considered to be within the scope of the invention as described and claimed, whether or not expressly described.

In addition to variations described above, for example, it should be evident that the actuation means may be power-assisted, whether via an electric motor, hydraulically, or pneumatically. The embodiment involving the wormscrew, for example, lends itself particularly well to the use of a small electric motor, powered by a battery, to rotate the wormscrew to thereby vary the position of the seat. A suitable control can be positioned on the armrest. Such an arrangement is obviously advantageous for those users who have difficulty in operating purely mechanical means.

INDUSTRIAL APPLICABILITY

The invention provides improved seating options for those using wheelchairs for mobility.

CLAIMS:

1. A wheelchair seat mechanism, where the wheelchair comprises opposite side frame members (6) and a seat platform (14) carried by seat support means between said side frame members, characterized by said seat platform being slidably mounted with respect to said seat support means for fore and aft movement, and further characterized by actuation means (22, 44) connected between said seat support means and said seat platform to produce said movement.

2. A wheelchair seat mechanism as recited in claim 1, where said actuation means is characterized by a rack (16) mounted above said support means, running fore and aft, and a large-diameter handwheel (22) and beneath it a substantially smaller-diameter pinion gear (20), coaxially mounted and connected for rotation together with each other on a vertically oriented shaft (26) mounted on the underside of said seat platform to project downwardly therefrom, said pinion gear having circumferential teeth connected to engage teeth along one side of said rack, said handwheel being sufficiently large in diameter to project forward of the front edge of said seat platform, whereby said handwheel may be readily rotated manually to thereby produce said fore and aft movement of said seat platform with respect to said wheelchair.

3. A wheelchair seat mechanism as recited in claim 2, further characterized by an intermediary spur gear mounted on the underside of said seat platform between said pinion gear and said rack.

4. A wheelchair seat mechanism as recited in claim

3, further characterized by locking means for locking said seat platform in a desired position with respect to said seat support means, comprising an assembly (32) mounted to the underside of said seat platform, and a pin (33) which is moveable with respect to said assembly so as to be positionable in and retractable from any one of a plurality of holes (30) spaced apart near the circumference of said handwheel, to thereby prevent rotation of said handwheel.

5. A wheelchair seat mechanism as recited in claim 1, further characterized by a long screw (40) mounted longitudinally between bearings (42) on the underside of the front and back of said seat platform, rotatable via a hand crank (44), such rotation pulling said seat platform in one direction or the other with respect to a fixed nut (48) mounted on a cross-piece (49) between the frame members.

6. A wheelchair seat mechanism as recited in claim 5, further characterized by two stop nuts (50) secured to said screw one ahead of said fixed nut and the other behind said fixed nut, said stop nuts rotating with said screw such that one or the other comes into contact with said fixed nut at fore and aft extreme positions, thereby providing means for adjusting the maximum fore and aft positions of the seat platform.

7. A wheelchair seat mechanism as recited in claim 1, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

8. A wheelchair seat mechanism as recited in claim 2, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

9. A wheelchair seat mechanism as recited in claim 3, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

10. A wheelchair seat mechanism as recited in claim 4, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

11. A wheelchair seat mechanism as recited in claim 5, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

12. A wheelchair seat mechanism as recited in claim 6, further characterized by a pair of generally C-shaped rails (8) mounted above said support means, spaced apart laterally from each other, facing each other and running fore and aft, said seat platform being adapted to run in said rails on bearing means (10, 15, 42).

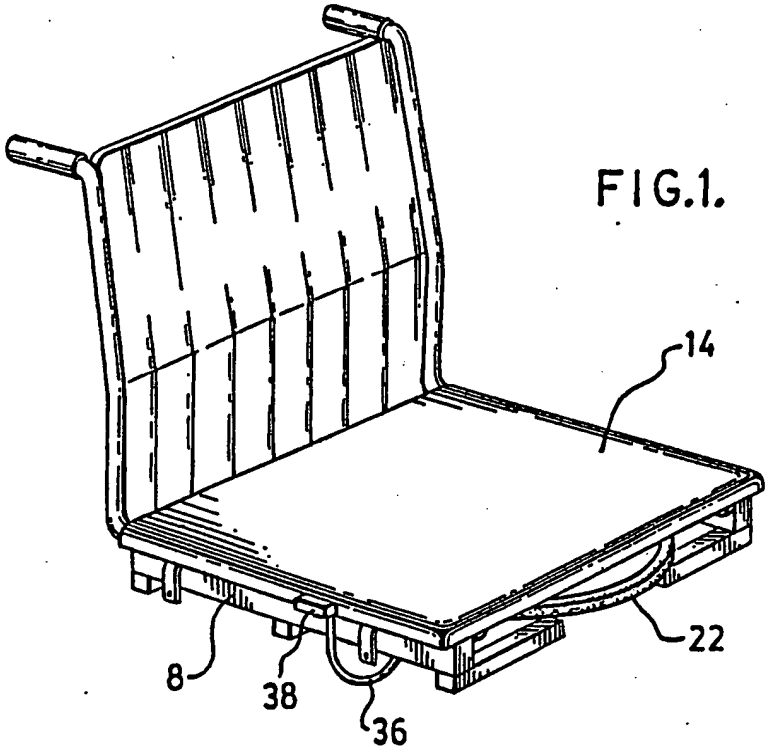


FIG.1.

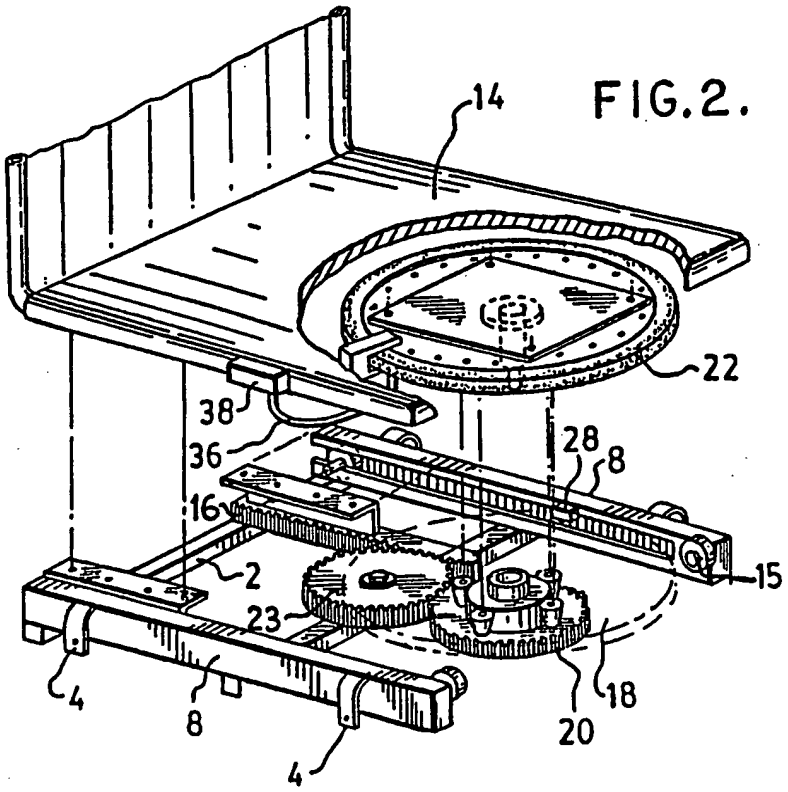
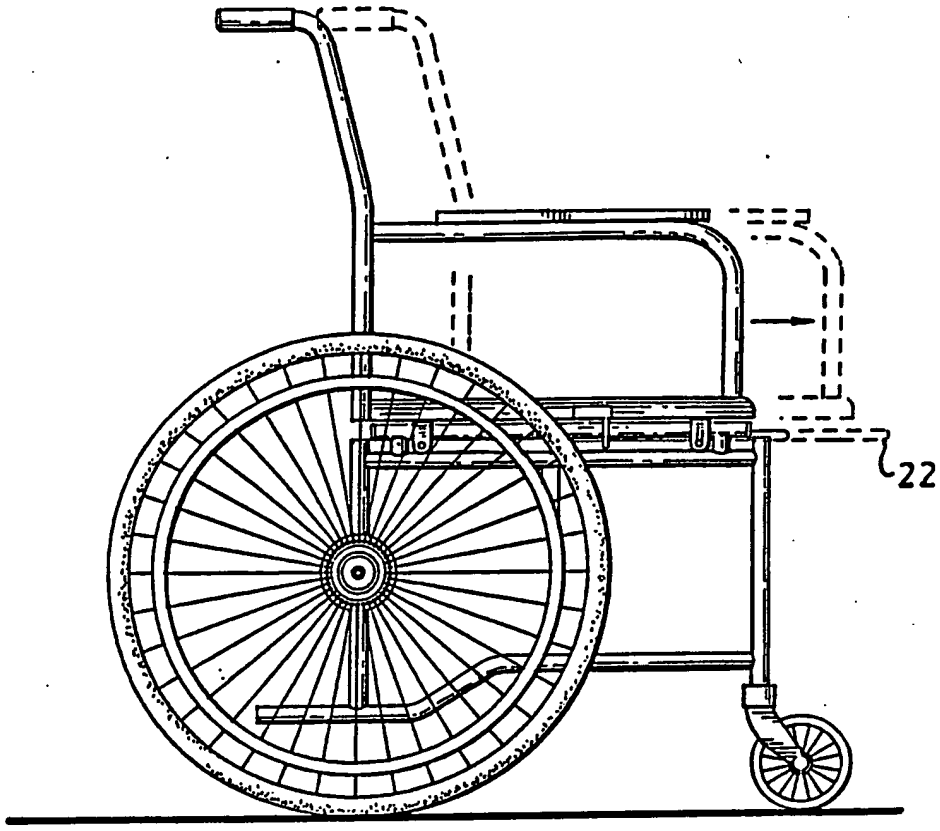


FIG.2.



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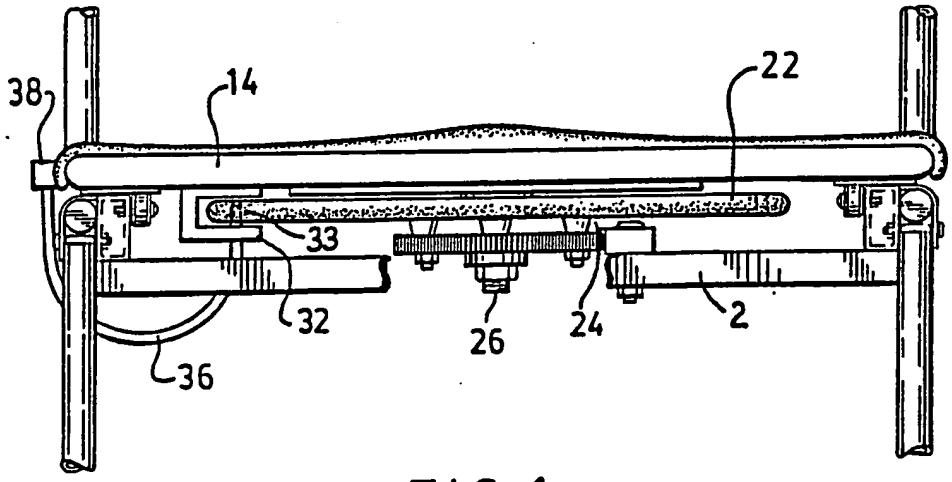

FIG.4.

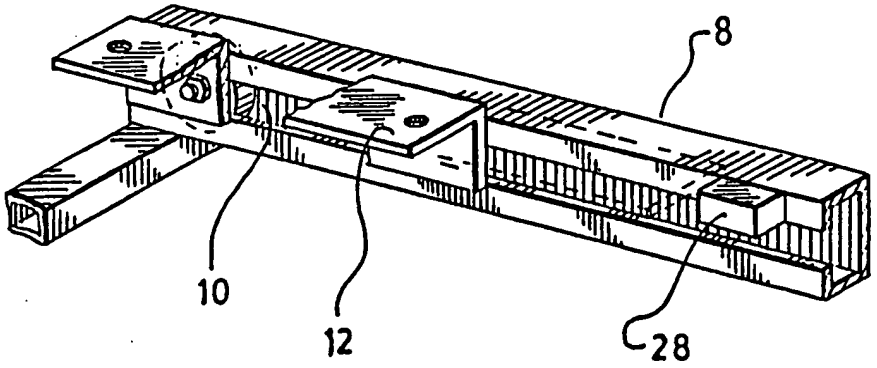

FIG.8.

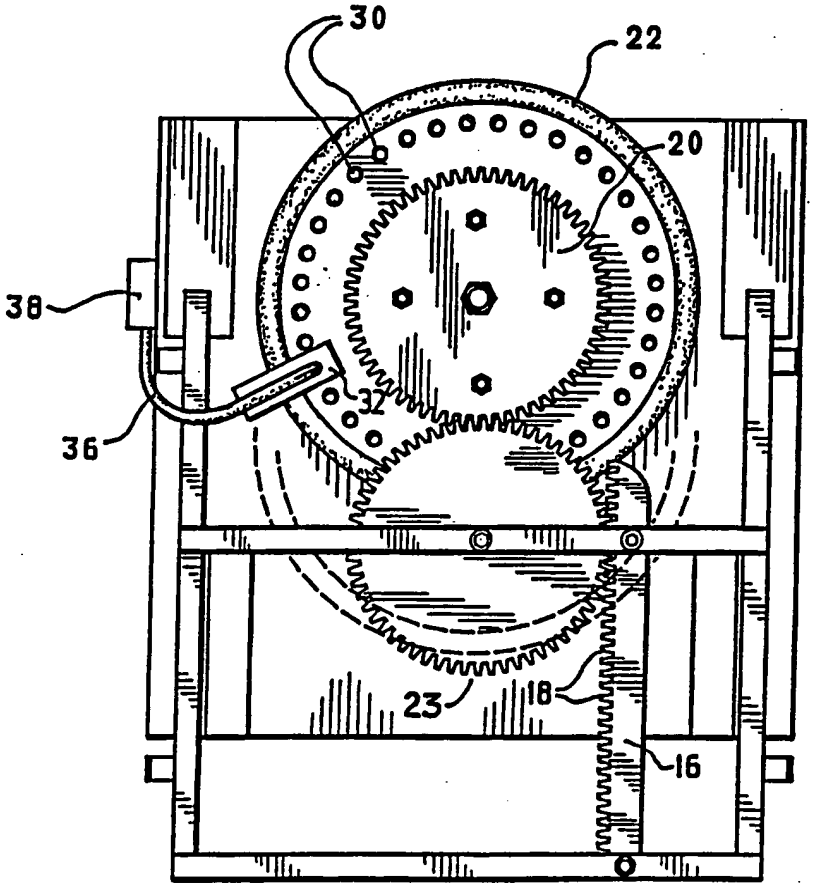

FIG.5.

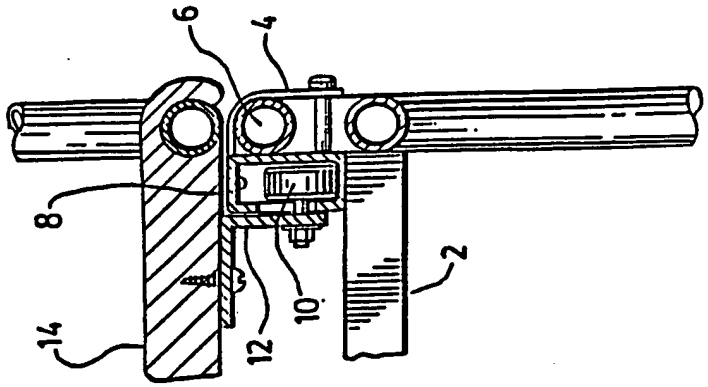

FIG.7.

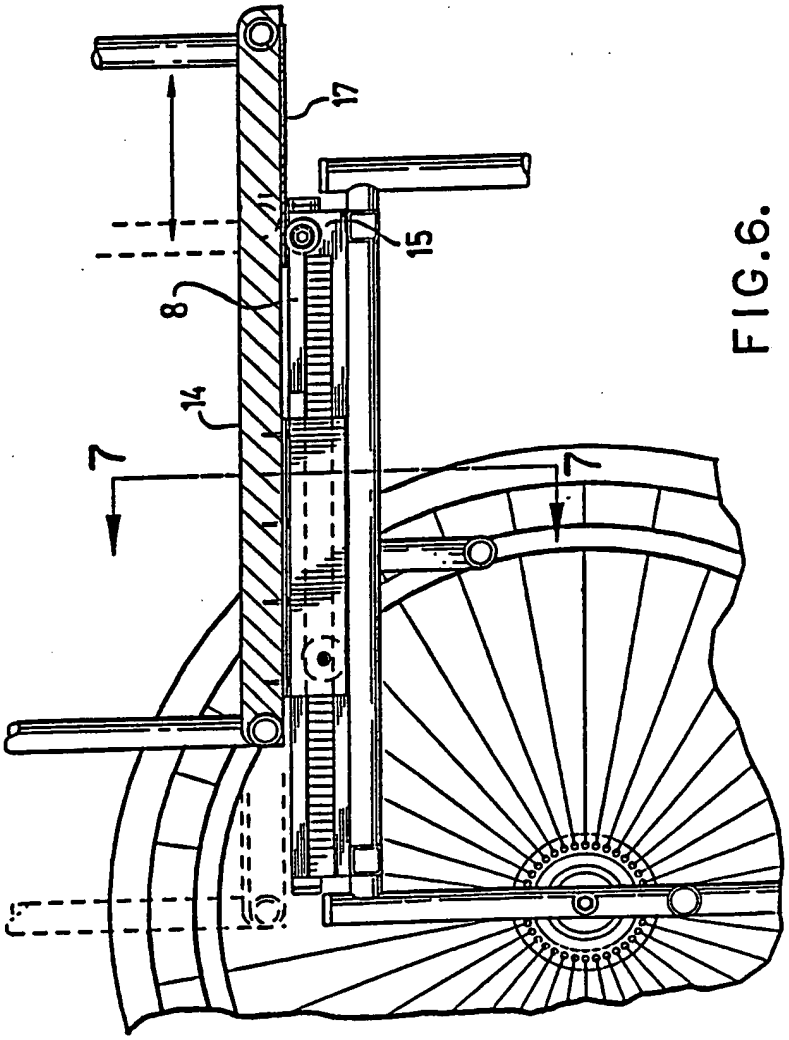

FIG.6.

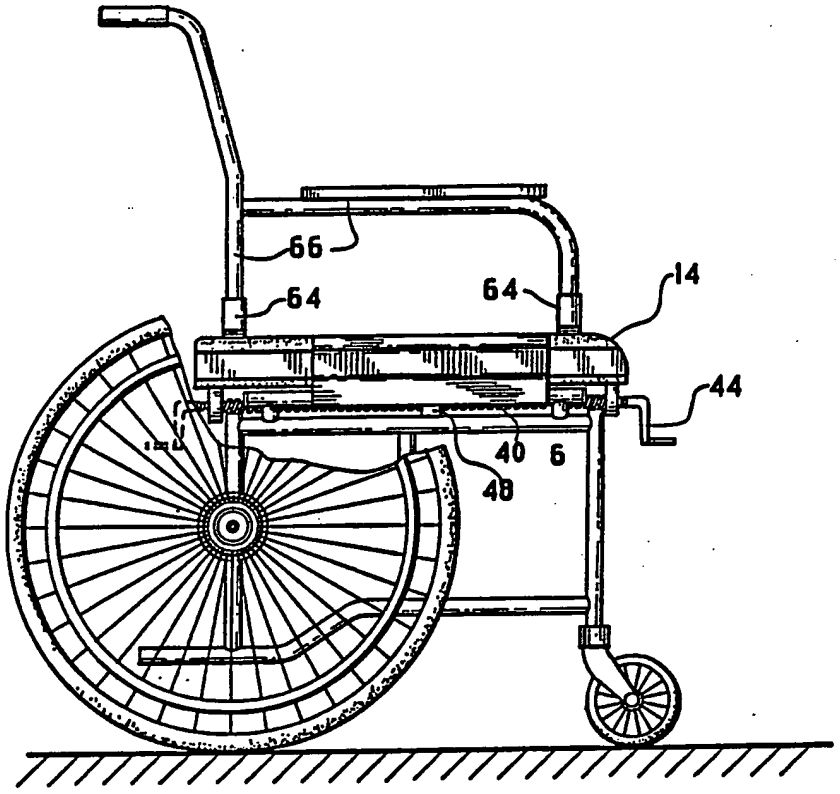

FIG.9

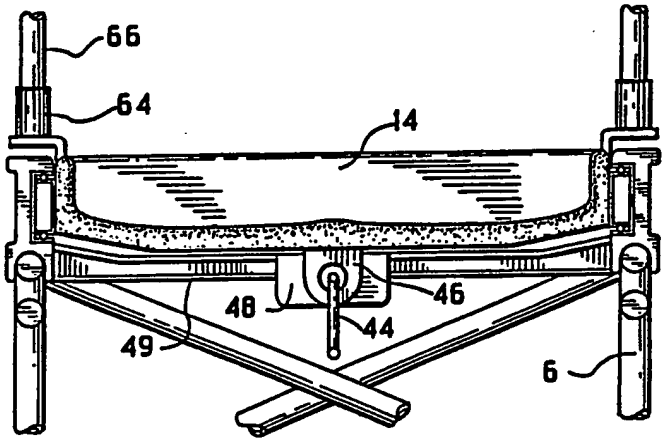

FIG.10

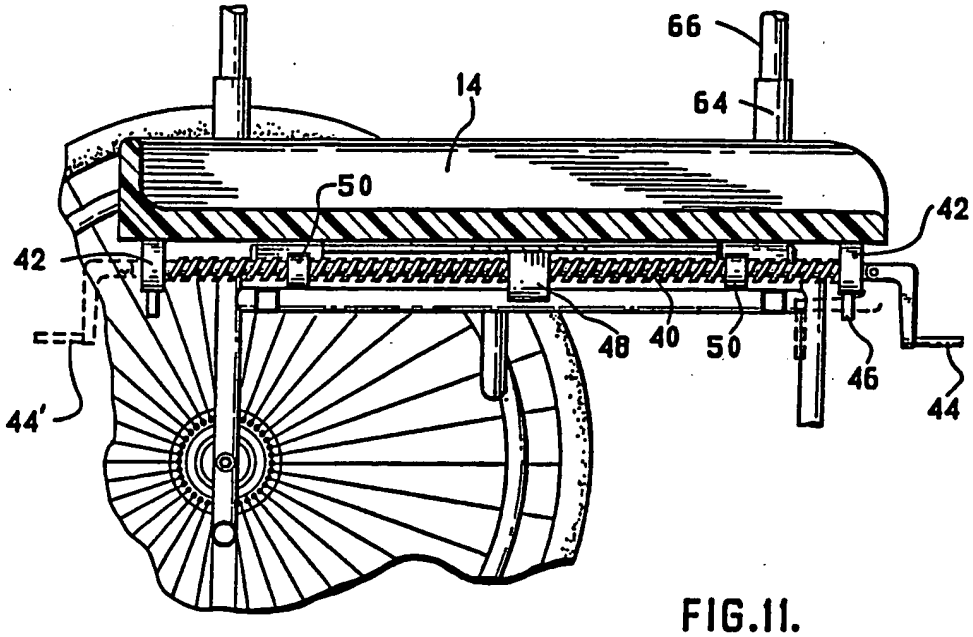

FIG.11.

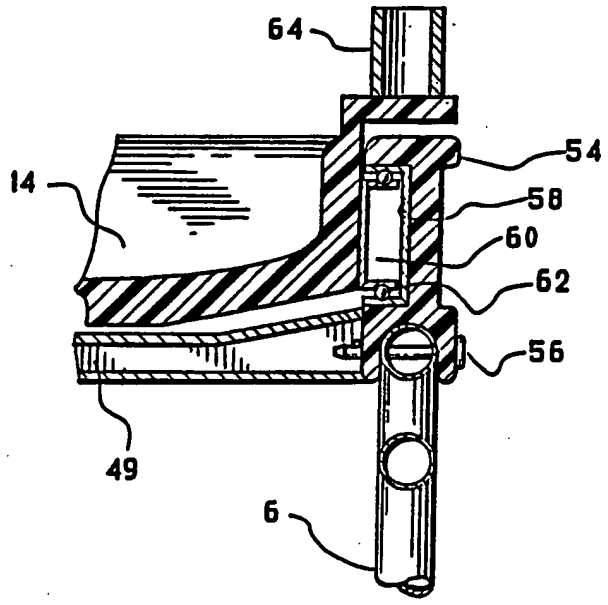

FIG.12.

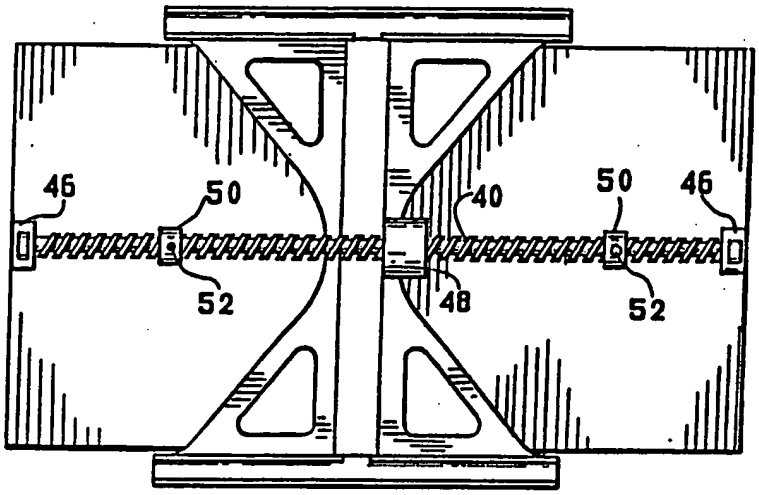

FIG.13

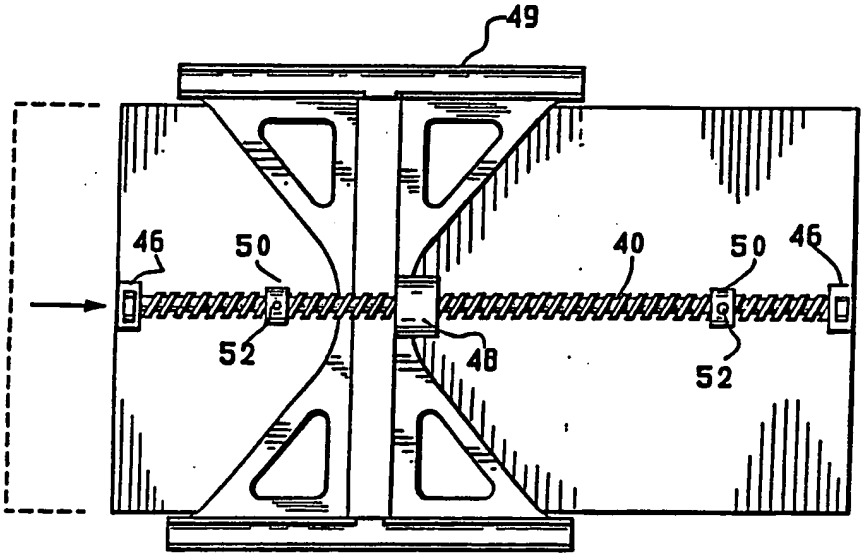

FIG.14

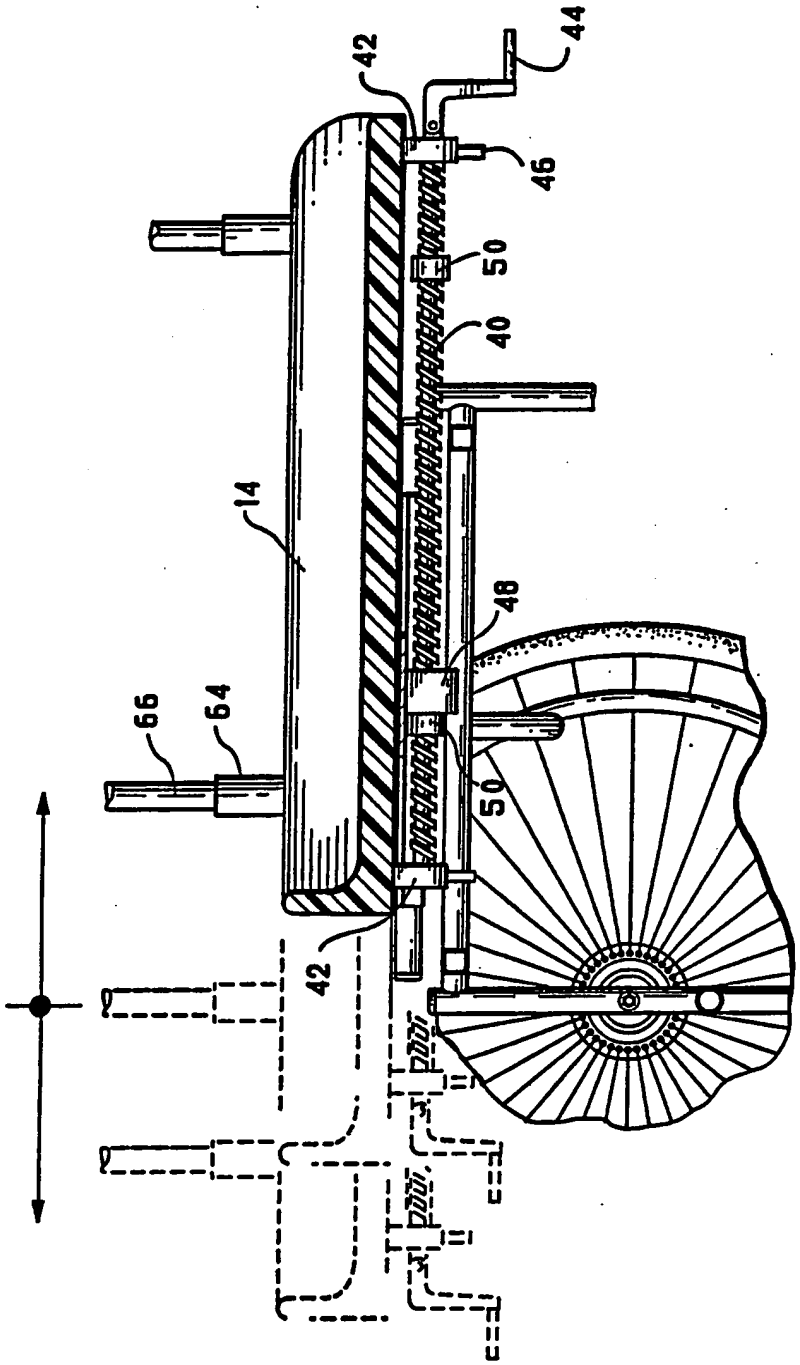

FIG. 15.

INTERNATIONAL SEARCH REPORT

International Application No PCT/CA 92/00271

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A61G5/10

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	A61G

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X Y	GB,A,114 795 (ELLIMAN) 18 April 1918 see claims; figures	1 7
Y A	GB,A,2 206 088 (RUSE) 29 December 1988 see page 6, line 16 - line 18 see page 6, line 34 - page 7, line 3; figures	7 5
A	GB,A,2 026 398 (HEMS) 6 February 1980 see page 1, line 94 - line 98; figures	1
P,A	US,A,5 028 221 (ABRAHAM) 2 July 1991 see abstract see figures	1
A	FR,A,2 530 951 (FRIENDS OF DISABLED ASSOCIATION) 3 February 1984	-
A	WO,A,8 810 082 (ERIKSSON) 29 December 1988	-

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
29 JULY 1992	17.08.92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	GODOT T.

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. CA 9200271 SA 61207

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 29/07/92
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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GB-A-2206088	29-12-88	None		
GB-A-2026398	06-02-80	None		
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